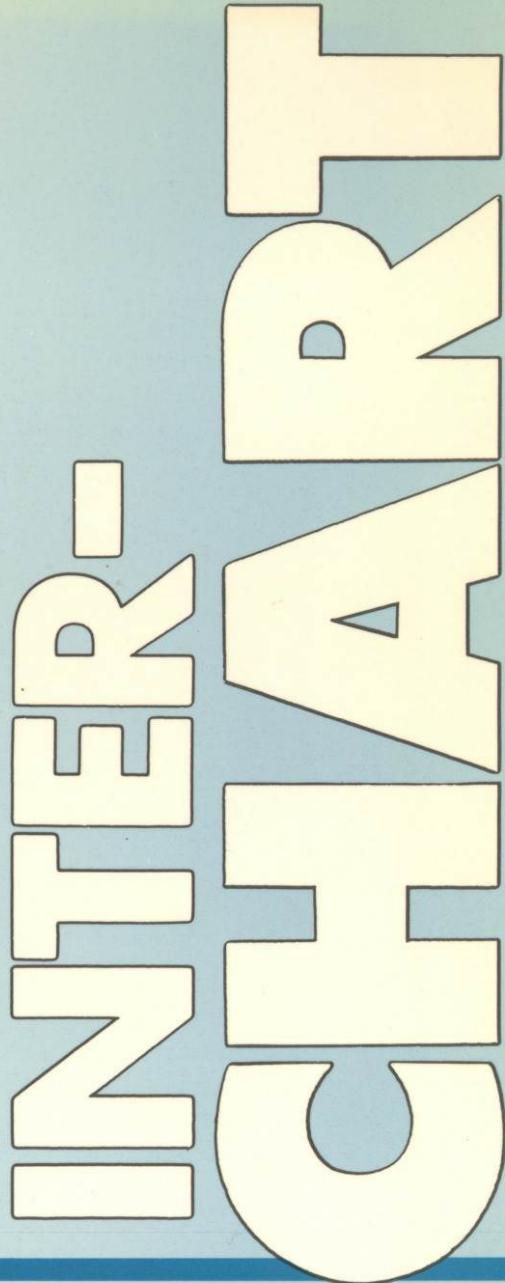


Reference Manual



Computer Concepts

004066

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1. Introduction

INTER-CHART is designed to produce graphical displays from numeric data. It can be used as an integral part of the ROM-LINK series, particularly for use with the INTER-SHEET spreadsheet package, but freely accepts data from a range of other sources.

The data used to produce graphs can be entered directly at the keyboard, read from a file, or 'imported' direct from a ROM-LINK package, such as INTER-SHEET. Data from different sources can even be merged into a single graph.

To allow mistakes to be easily corrected, regardless of the source of the data, a comprehensive built-in editor is provided. The editor displays data in the form of a bar chart, or as a line graph, depending upon the type of data. Any number of data items can be entered, from any of the sources mentioned, available memory being the only limit to the amount of data which can be stored.

Once data has been entered, a variety of graphs can be produced. A graph can be displayed on-screen in a 'display' mode, and later printed. The type of graph displayed can be changed at any time. The three choices of graph are Pie chart, Bar chart and Line graph. Because it is so easy to change the type of graph displayed, the type which best shows any significant factors in the data is easily found. Printing the same data in all of the graph types, one after another, takes little further effort.

It is often the case that separate, but related, sets of data are collected and need to be handled in parallel. For instance, sales figures for different years are often displayed as graphs used for comparison purposes. INTER-CHART will allow as many as sixteen graphs to be handled at once (and even to have more than one set of sixteen graphs in memory at the same time). Each set of data may be given a name, displayed or printed as separate graphs, or displayed on 'overlaid' graphs. Taking the example mentioned, the sales figures for two or more years can be overlaid and displayed or printed as a single graph. Any

number from one to sixteen sets of data can be overlaid on one graph. This makes comparison very easy.

Access to the different facilities available in INTER-CHART is by selection from an option menu. This displays all the major facilities available, numbered 1-9, which the user may select by simply pressing the corresponding option number. Users familiar with WORDWISE, INTER-SHEET, or other ROM-LINK packages will notice that the INTER-CHART menu is very similar.

Manual layout

The rest of this manual is divided into two major sections. The first is a practical section, divided into sub-sections under practical headings. Rather than describing each command, the information is presented as complete explanations of 'how to do' something. Therefore if the user wants to know how to load a file for instance, the section on loading is the place to look, rather than trying to find which commands have something to do with loading and searching through them all.

The second section of the manual is for reference. Again, this is divided into sub-sections so that a particular topic is more easily located. These contain a summary of menu options, function keys, useful star commands and colon commands. The final section is a quick-reference index.

Reading order

Reading technical manuals is not much fun, but neither is the frustration over a problem which could have been avoided. The latter often turns out to be worse!

Rather than going into details about certain reading orders according to experience and so on... the reading order is simple. Read the next section which takes a step-by-step look at each of the main areas of INTER-CHART. After that, each chapter is very much self-contained, so that each can be read when required or all at once. It will be found that after only a short time the quick reference card will provide sufficient information, with only occasional references to this manual.

PRACTICAL SECTIONS

2. Making a start

This section is intended as an introduction to the first practical session with INTER-CHART. In simple stages, the user is taken through entering some data, displaying it in the different graph forms, and finally printing the result. Screen print-outs are liberally scattered throughout the descriptions presented, so that (a) they can be compared, as a check, with the actual screen when using INTER-CHART, and (b) so that reading through this section without the computer at hand, the end result of each step can still be observed.

Start with the first operation of switching on the computer and any other devices - disc drives, monitor, etc.

Type the command

I CHART **RETURN*

The INTER-CHART menu should immediately be displayed on the screen. If it is not, then you should refer to the fitting instructions supplied, because the ROM or the machine is apparently not working correctly.

At this point INTER-CHART is ready to use. The next step is to enter some data so that graphs can be produced. The easiest way to enter data is from the keyboard using the built-in editor. Up to sixteen different sets of data may be present in memory at the same time, so each is given a name to distinguish it from the rest. Option-5 in the menu is used to select between the sets of data in memory. The name of the current graph is always displayed immediately after option-5 on the menu. Because no

data has yet been entered at this stage, the menu will show the name of the current graph as "**(none)**", because there isn't one!

Select option-5 of the menu by pressing just the **5** key – no need to press **RETURN**. The screen will clear and indicate that there are no current graphs. A prompt asks for the name of a graph. The name is not important at this stage, since the data is just for testing purposes, so just use the name "test" by entering **test** **RETURN**

INTER-CHART can handle two distinct types of graph, labelled and scaled. A label type graph is generally one in which the x-axis is not a measurement, but a label. For instance, a graph labelled with January, February, March, etc. is a labelled graph. An x-axis scaled with, say, time continuously measured would be a scaled type graph. Data for scaled graphs always consists of pairs of x,y values, whereas data for a labelled graph is in pairs of label, value. Labelled graphs are easier to understand, and are more familiar in every-day life. When creating a new graph, INTER-CHART will always ask for its name and then a choice of labelled or scaled. The data is handled differently for the two types.

In response to the prompt, select a label type graph by pressing the **L** key. This is the final question asked when creating a new set of graph data. Press the space bar in response to the "Press any key" prompt now displayed.

The menu will re-display, showing the current graph as **(test)**. Press the **ESCAPE** key to enter edit mode.

The screen will change to display, in graphics mode, the standard axis of a labelled graph. By default, the x-axis will show ten blank entry positions. The screen should now look like that in Fig.1.

When data is entered in edit mode (for a labelled graph) the display is a form of simple bar chart. Each item entered is displayed as a bar above its label and of a height corresponding to the magnitude of the number. To show where data is to be



4772 bytes free
Enter value/label:

Fig.1 The standard edit mode axis for a 'label type' graph.

entered on the graph, a single vertical dotted line acts as a cursor. The cursor can be moved from one entry position to another with the arrow keys **←** and **→**. With the line cursor on the first entry position (far-left), type the following list of data. Note that the cursor will automatically step to the next entry point when **RETURN** is pressed after entering the number. Watch the scale on the y-axis appear and re-scale when necessary.

```
"JanRETURN  
10RETURN  
"FebRETURN  
22RETURN  
"MarRETURN  
36RETURN  
"AprRETURN  
40RETURN  
"MayRETURN  
30RETURN  
"JunRETURN  
5RETURN
```

The complete details of how to use the editor and the facilities available are described in a separate section. Rather than covering the same ground here, data has been entered, and that is sufficient. The screen display at this stage is shown in Fig.2.

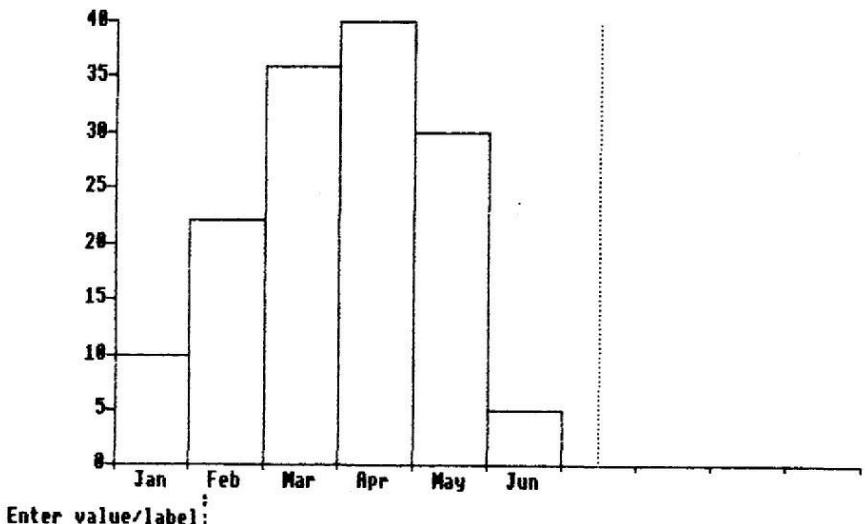


Fig.2 An example of data entered in edit mode.

Press the **ESCAPE** key to return to the main menu, which will be displayed on the screen as it was before going into edit mode. Repeated presses of the **ESCAPE** key at this stage will alternately select and display the edit mode and menu mode.

Displaying the graph

From the menu select the display option by pressing the **7** key. Immediately a line graph of the data appears on the screen with the axis labelled. A line graph is the default graph type, but this is easily changed to display a bar chart or pie chart of the same data by pressing the **f3** key. This will prompt for a choice of graph: Line, as currently displayed, Bar, similar to the edit mode display, or Pie. The response should be **L**, **B** or **P**.

Obviously choosing a line graph would achieve nothing at this point. Figures 3, 4 and 5 show the data displayed in each of the three graph types. It is important to remember that a set of data entered is not stored as a specific sort of graph (other than the distinction between labelled and scaled), and that the data for a labelled graph may be displayed in any of the three graph forms at any time. Try selecting the different types of graph shown in Figures 3, 4 and 5.

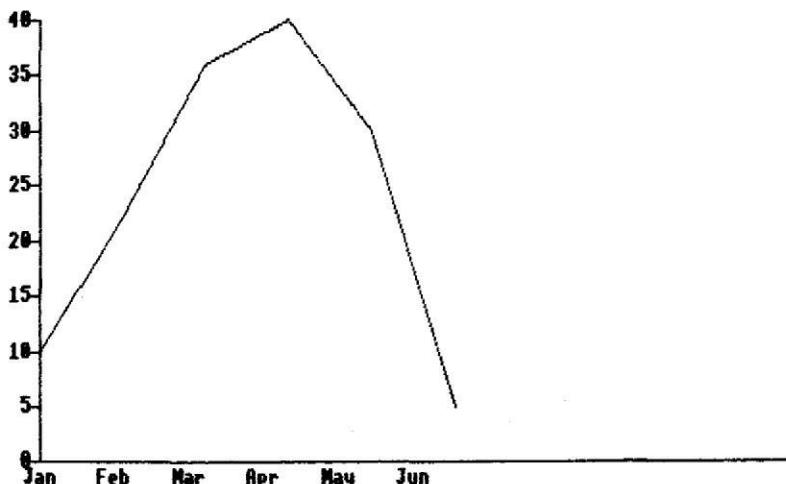


Fig.3 Line graph.

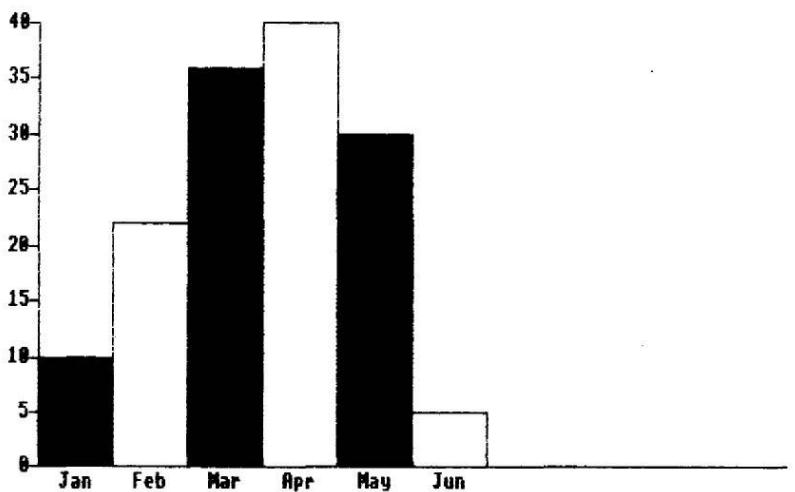


Fig.4 Bar graph.

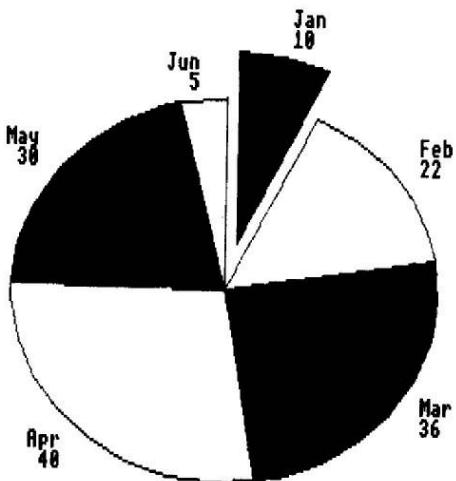


Fig.5 Pie chart.

Printing

Printing a graph is not necessarily the same procedure for every user. It depends upon the printer attached to the computer.

INTER-CHART has a built-in screen dump routine for use on EPSON printers and others which are compatible. The majority of dot-matrix printers fall within this range, but some do not, and daisy-wheel printers definitely do not. The rest of this section briefly covers printing the graphs obtained. If the built-in screen dump is not suitable for the printer in use, or if the description here is insufficient to obtain a correct dump, a much more complete description can be found in section-6. Do not spend hours struggling at this stage; leave it for now and try later after reading section-6.

It is surprising how much time is wasted on the simplest of mistakes such as forgetting to turn the printer on! Ensure that your printer is plugged-in, switched on, on-line, supplied with paper, etc. There are two different ways of connecting a printer to the BBC micro. The normal method is called a 'parallel' or 'Centronics' interface, which connects via a flat cable underneath the computer. If your printer is connected via the alternate method, called a 'serial', 'RS232' or 'RS423' interface, plugged into the back of the computer, then you must enter an additional command. If this is the case, enter the menu (by pressing **ESCAPE**) and type

*** FX5,2 RETURN**

then re-enter display mode by pressing the **7** key.

The command simply tells the computer that a serial interface is being used, otherwise it assumes that a parallel interface is in use.

From display mode, with the graph to be printed shown on the screen, press the **14** key. This tells INTER-CHART to use the built-in screen dump and to start printing.

If all is well, there will be a slight pause for a few seconds, then the printer should jump noisily into action. Screen dumps are always relatively slow compared with normal text printing, so do not worry if there are long pauses when the printer is apparently doing nothing, this is normal.

Conversely, if all is *not* well, the printer might not start, and the 'caps lock' and 'shift lock' LEDs on the keyboard will probably illuminate. This indicates that the printer is not accepting the data being sent. If the printer does start, but prints rubbish, then the printer is not understanding the data sent to it. In either case of failure, press the **ESCAPE** key and wait for the menu to re-display. Do *not* press the **BREAK** key, unless **ESCAPE** fails to achieve anything after a few seconds. If **BREAK** has to be pressed, reset the printer, which is usually a case of switching it off and back on again. If successful printing cannot be achieved, refer to section-6.

Assuming that the printout worked, further printouts of each other type of graph may easily be obtained. Simply select a different graph display by using **f3**, then print the new graph by pressing **f4**.

NOTE: *Always use the **ESCAPE** key to interrupt a screen dump if this should be necessary. Wait a few seconds for the printing to stop.*

If all of this section has been read and understood, sufficient knowledge should have been gained to proceed to enter other graph data and continue independently. Each of the practical sections hereafter will help to gain a more complete understanding of each operation. Switching off and repeating the operations described in this section will help in gaining a firmer grasp of INTER-CHART on the whole.

3. Entering and Editing

Edit mode can be used to edit data already in memory, whether loaded from file, transferred from another package, or entered from the keyboard. Edit mode is also used for the actual entry of data from the keyboard.

Concisely, the edit mode displays the current set of data in a graphical form, allows any entry to be examined, changed, deleted and new entries to be added.

The way in which label type graphs and scaled graphs are displayed in edit mode is quite different, though controls have been kept the same wherever possible. Therefore, it is necessary to divide this section into two separate descriptions. The previous section described briefly how to start a new graph of either type by using menu option-5, and this is discussed more fully in section-7 if its use is not immediately clear.

On entry to edit mode, the highest resolution graphics mode available will be selected. If sufficient memory is available, mode-0 will be used and if not, mode-4 will be used. If insufficient memory is left for even mode-4, then the edit mode cannot be entered at all and a message "No room" will be displayed. If this occurs, it would be wise to save one or more sets of data and then delete them to increase the amount of memory available. It may also be possible to save and delete other ROM-LINK packages. If shadow RAM is employed in the machine, mode-0 will always be selected for edit mode. On entry to both edit mode and display mode the amount of memory free is displayed.

Editing labelled graphs

A label type graph is displayed in the form of a bar chart in edit mode. Whenever starting a new graph from scratch, entering edit mode will display a blank y-axis and ten divisions marked on the x-axis, as described in the previous section. Two types of entry may be made: a label, or a number, and although these can be entered separately, neither has any meaning alone.

A vertical 'dotted' line is positioned at the first bar when the edit mode is entered. This bar acts as a cursor, showing where data will be entered on the graph. Using the left and right arrow keys will move this cursor left or right from one entry position to another. Holding the keys down will move quickly along the entry positions.

A label is entered by typing a double-quote mark ("") as the first character. **RETURN** should be pressed to complete entry of the label. Closing quotes are not necessary and should not be typed. This is the same as the entry of labels in INTER-SHEET.

A value is entered simply by typing the number and pressing **RETURN**. Numeric expressions are not permitted, but one function – **IMP** – is available. This is described in section-13.

To enter **JIM** as a label and **20** as a corresponding value, move the cursor line to the first entry position and type:

"JIM **RETURN**
20 **RETURN**

Several things occur upon entry of this data. The most noticeable is the bar which appears in the first entry position. The y-axis is automatically scaled to accommodate the value **20** (the display always re-scales automatically whenever a value outside the current range is entered). The label "**JIM**" appears on the x-axis. Finally, the cursor line moves right to the next entry position. The screen display at this point is shown in fig.6.

INTER-CHART provides the facility to have the cursor line automatically move to the next position after data is entered. Because data can be entered in different orders, different settings are provided. Data can, for instance, be entered as label and value pairs. The same data could alternately be input by entering all labels, then putting the cursor back to the start and entering all of the corresponding values. In all of these cases the auto step-on should cause the cursor to move to the next position after the data for one position has been entered. If a label and number pair is entered then the cursor must move,

not after the label, but after the value. However if just labels are entered, it must obviously step-on after every label.

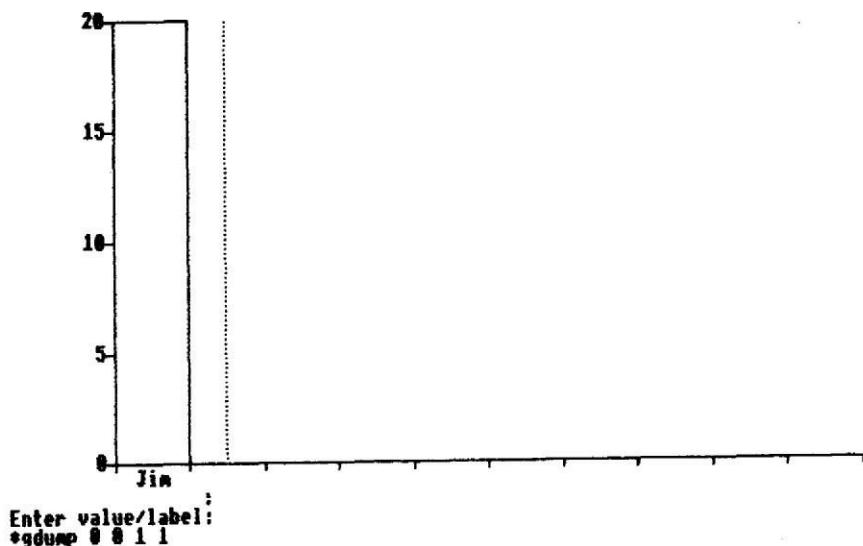


Fig.6 Entering data on a labelled graph.

The auto step-on setting is used not only for entry from the keyboard, but also when importing data from file or from another ROM-LINK package, as described in the relevant sections.

Three auto step-on settings provide the necessary flexibility, a fourth setting – off – will prevent automatic cursor step-on altogether. The settings allow auto step-on as follows:

- 1) after entering a value (default setting)
- 2) after entering a label
- 3) after entering either label or value
- 4) off. No auto step-on.

Whether auto step-on is used or not, the cursor line may still be moved manually by pressing the cursor keys \leftarrow and \rightarrow .

Pressing **f6** repeatedly will cycle through the various settings, displaying the new setting at the bottom of the screen as it is changed.

Leave the setting as it is, step on value, for the examples which follow.

With the cursor line on the second entry position, make the following entries. The data represents names and ages, labels and values.

```
"Mike RETURN  
16 RETURN  
"Rob RETURN  
31 RETURN  
"Janet RETURN  
46 RETURN  
"Ian RETURN  
30 RETURN  
"Charles RETURN  
36 RETURN  
"Carol RETURN  
21 RETURN
```

The screen display will now be as shown in Fig.7.

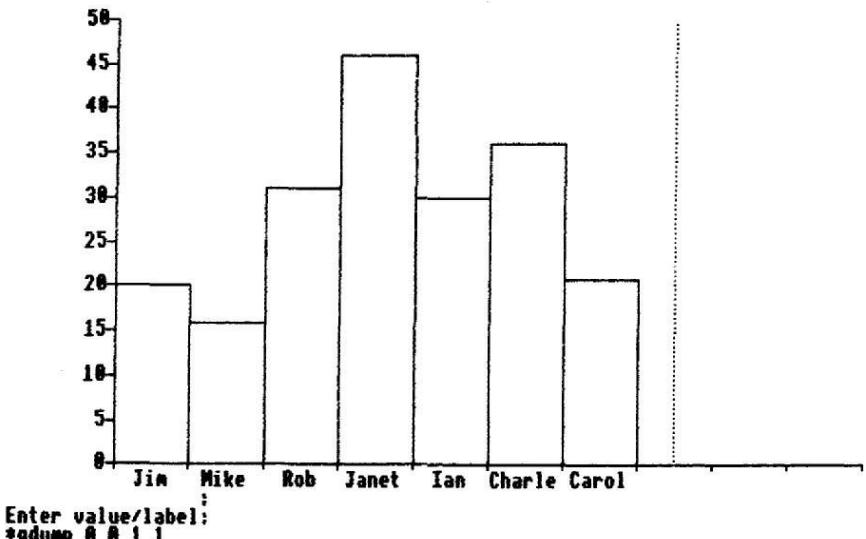


Fig.7 Entries on a labelled graph.

The data entered fills only seven of the ten positions created automatically on a labelled graph. The remaining three positions are not required and should be removed from the graph.

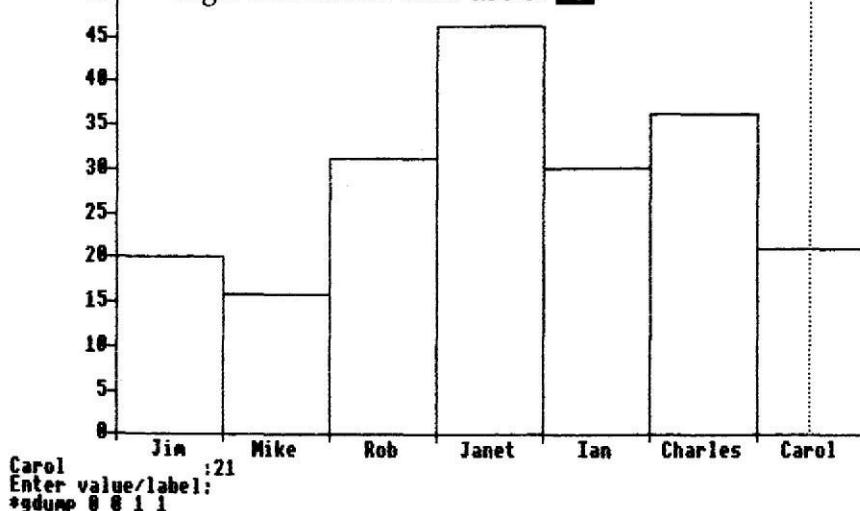
Deleting entries

There are two ways in which entries can be deleted, both are actioned by the use of function keys. Pressing **f7** will delete the entry on which the cursor line is currently positioned. The **f9** key is more drastic, it deletes all entries to the right of and including the current cursor position.

Deleting an entry with **f7** or **f9** will not only remove the value and label from that position, it actually removes the entry position altogether. The screen re-scales to accommodate just the number of entries left.

Continuing from the previous example, place the cursor line on the first unwanted entry position and press the **f9** key to delete that and the other unwanted entry positions to the right. Because the action of the **f9** key is so drastic, a safety-net prompt asks **Are you sure ? (Y/N)** whenever **f9** is pressed, in case it is pressed accidentally. In this instance, confirm the action by pressing the **Y** key. Immediately the screen will clear and re-display with the graph showing just the remaining entries. The screen at this stage is shown in Fig.8.

Fig.8 The screen after use of **f9**.



Notice in Fig.8 that the bars are wider now because there are less of them and the screen has been automatically adjusted to hold those which remain.

Highlighting

Often, when an item of data is of particular interest, it should be 'highlighted' on the final graph to make it stand out from the other data. Highlights on bar charts and pie charts are implemented in display mode and will be discussed further in the next section. However, the data item which will be highlighted is the one on which the cursor line remains when leaving the edit mode.

The remainder of the labelled graph editing features can be described briefly and summarised thereafter. The actions of automatic re-scaling and auto step-on have been covered, and further functions work along the same lines.

Pressing \leftarrow or \rightarrow

The left and right cursor keys pressed on their own will move left or right one entry position. Moving off the right-hand end will create one new entry position each time the key is pressed.

Pressing $\text{CTRL} \leftarrow$ or $\text{CTRL} \rightarrow$

Pressing CTRL at the same time as the left or right cursor keys will move in jumps of ten entry positions at a time. When moving right in this way, if less than ten entry positions exist to the right they will be created. The graph is obviously re-scaled when this happens. Pressing $\text{CTRL} \rightarrow$ several times is a very fast way to increase the number of entry positions on the screen. If new entries are created accidentally, they can easily be removed by using f9 as previously described.

Pressing $\text{SHIFT} \leftarrow$ or $\text{SHIFT} \rightarrow$

Pressing the SHIFT key in conjunction with the left or right cursor keys will move the cursor line to the first or last positions in which data has been entered. No re-scaling takes place.

Changing existing data

Data which has already been entered, labels or values, can be overwritten or changed. If a label or value is entered in the

normal way, whilst the cursor line is positioned on an existing entry, the existing data is overwritten by the new. Changing an existing entry is achieved by using the normal text cursor editing, enabled by pressing the **↑** key.

Pressing **↑** (enabling text cursor editing keys)

Use of the **↑** key will enable the normal text cursor and editing keys. The label and value entered at the current position are always shown above the entry line; enabling the edit keys allows the current entries to be edited. This is done by moving the text cursor to the label or value shown, copying any required parts of it, and adding to it from the keyboard. Pressing the **RETURN** key enters the modified label or value and turns off text cursor editing.

'Star' commands

Typing a * instead of a value or label will allow a 'star' command to be entered. Text scrolls in the text window at the bottom of the screen, which makes it difficult to read many lines of text generated by, for instance, a *HELP command. Holding **SHIFT** and **CTRL** at the same time will temporarily halt scrolling until the keys are released.

'Colon' commands

Typing a : instead of a label or value will allow a 'colon' command to be issued. This can be used to import data from a ROM-LINK package, or whatever other colon commands are provided in the particular machine.

Summary of labelled graph editing keys

- f6** Changes the auto step-on option.
- f7** Deletes the entry at the cursor line.
- f8** Inserts a new entry position immediately to the left of the cursor line.
- f9** Deletes all entries at and to the right of the cursor line.
- ←** Moves the cursor line left one position.

- Moves the cursor line right one position.
- ↑ Enables text cursor editing.
- CTRL** ← Moves the cursor line ten positions to the left.
- CTRL** → Moves the cursor line ten positions to the right.
- SHIFT** ← Moves the cursor left to the first entry position.
- SHIFT** → Moves the cursor right to the last position at which data has been entered.
- * Allows entry of a 'star' command.
- : Allows entry of a 'colon' command.

Editing scaled graphs

The editing functions available for scaled graphs are very similar to those for labelled graphs. The main difference is the display: labelled graphs are displayed as a bar chart, but scaled graphs are shown as a line graph.

The screen does not have a fixed number of entries, but instead allows any number of data entries within the scale. Any entries outside the range cause re-scaling to accommodate. Both the x-axis and y-axis are marked with a continuous numeric scale. By default, both axis are assumed to be positive, but entering a negative x or y value will simply re-scale to show a proportionate amount of negative x-axis, y-axis, or both.

Scaled graphs would be used for applications with continuous data such as time plotted against temperature, current against voltage, etc. The x-axis and y-axis are scaled independently. It is important to remember however, that this is only the edit mode and does not represent the actual graph. When the actual graph is produced in display mode, the x-axis scale and y-axis scale can be specified, they can be logarithmic, the line can be drawn between points or omitted, etc. All such options are offered when the graph is shown in display mode. The edit screen is only a very simple line graph representation.

An entry on a scaled graph consists of an x,y pair. One or the other alone is meaningless and is therefore ignored. There are no set entry positions and entries are not made at the cursor position. Instead, when a pair of x,y values are entered (separated by a comma), a point is entered at those co-ordinates. The line graph is re-plotted, joining the new point at the correct position.

The line drawn always joins the points in order of the x-co-ordinate. If multiple points exist with the same x-co-ordinate, i.e. where a vertical line is drawn, the points on that line are joined in order of entry. This makes an important difference with regard to the line drawn. If, for instance, the first point entered on a vertical line lies in the middle of it, the previous point will join to the middle! Therefore, the top and bottom points should be the first and last entered (or last and first!). However, the instances where this matters are rare and can be corrected by deleting and re-entering a point.

Instead of having a cursor line, a small square highlights the current entry. The left and right arrow keys move left and right between the points in x-axis order. Note that the cursor square will only move on to points entered, it is never positioned between two adjacent points. The cursor box is of far less use in the editing of scaled graphs. However, when **f7** or **f9** are used (delete current entry and delete all entries to the right) it is the cursor which marks the current entry.

As an example, start a scaled graph by using menu option-5 and enter edit mode by pressing the **ESCAPE** key. Enter the following as sample data:

```
0,0 RETURN
1,1 RETURN
2,2 RETURN
3,0 RETURN
4,1 RETURN
5,3 RETURN
6,0 RETURN
7,8 RETURN
9,0 RETURN
```

At this stage the screen display should be as shown in Fig.9.

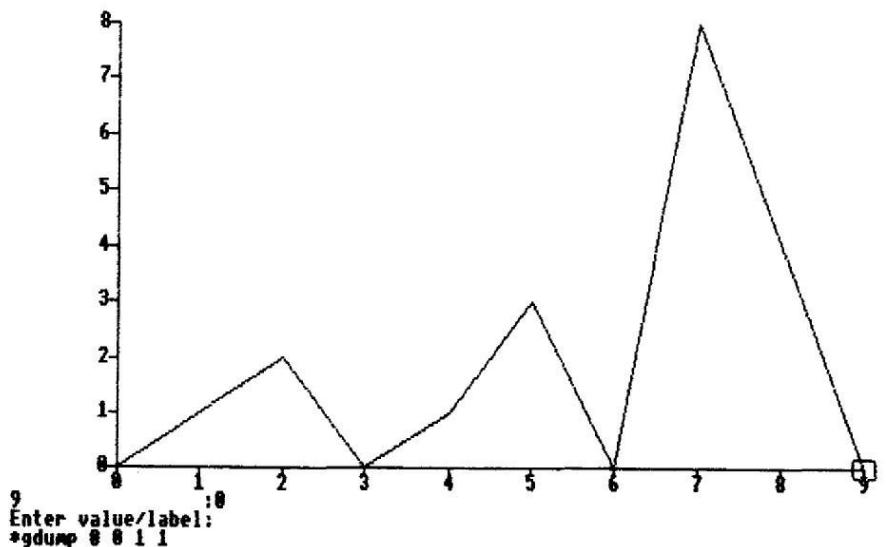


Fig.9 Editing a scaled graph.

Use this sample data to try the editing functions available. In outline, many of the operations available for editing labelled graphs are also available for use with scaled graphs. The main differences are:

- a) It is not possible to move outside the displayed graph area. Re-scaling takes place upon entry of a point outside the current scaled ranges.
- b) The cursor keys move between points plotted, not a fixed distance.
- c) Instead of a cursor line which is used on labelled graphs, a cursor square is used to indicate the 'current point'.

The function key **f6**, used for setting auto step-on when editing labelled graphs has no use on scaled graphs.

The function key **f8**, used to insert a new entry position in a labelled graph, has no use in the scaled graph environment. New entries in a scaled graph are automatically inserted at the correct position.

The editing functions are described below, followed by a brief summary.

Pressing \leftarrow Moves the cursor square left to the previous point on the x-axis. It cannot be positioned in the space *between* two points, only *on* a point.

Pressing \rightarrow Moves the cursor square right to the next point entered on the x-axis. It can only be placed on a plotted point.

Pressing $\text{CTRL } \leftarrow$ Moves the cursor square left ten plotted points in x-axis order, or as far as it can if less than ten points exist to the left. No re-scaling takes place.

Pressing $\text{CTRL } \rightarrow$ Moves the cursor square right ten points in x-axis order, or as many as it can if less than ten exist to the right. No re-scaling takes place.

Pressing $\text{SHIFT } \leftarrow$ Moves the cursor square to the furthest left point plotted. No re-scaling takes place.

Pressing $\text{SHIFT } \rightarrow$ Moves the cursor square to the furthest right point plotted. No re-scaling takes place.

Changing existing data

A point which has already been entered cannot actually be changed. It must be deleted and the new point entered.

Pressing \uparrow (enabling text cursor editing keys)

Pressing \uparrow will enable the normal text cursor and editing keys. The x and y values for the current point are always shown above the entry line; enabling the edit keys allows the current entries to be copied and used within the next data entered. This is done by moving the text cursor to the x or y value shown, copying any required parts of it, and adding to it from the keyboard to make a new x,y pair. This is useful when entering several different y values paired with the same x value, the x value being copied. Pressing the **RETURN** key enters the new point and turns off text cursor editing.

Pressing **f7** will delete the point at the cursor square position. The graph is re-drawn, joining the points previous to and following the deleted point. The cursor square is re-positioned on the point previous to the deleted one, in x-axis order.

Pressing **f9** will delete all points to the right of and including the point at the cursor square. Because the action of this key is so drastic, a safety-net prompt forces confirmation of the decision before action is taken. After deletion, the graph is re-scaled and re-drawn. The cursor square is positioned on the right-most remaining point.

'Star' commands

Typing a * instead of an x,y pair will allow a 'star' command to be issued. Text scrolls in the window at the bottom of the edit screen.

'Colon' commands

Typing a : instead of an x,y pair allows a 'colon' command to be issued. This can be used to import data from a ROM-LINK package, or to use whatever utility colon commands are provided in the particular machine.

Summary of scaled graph editing keys.

- f6** No function.
- f7** Deletes the point at the cursor square position.
- f8** No function.
- f9** Deletes all points to the right of and including the one at the cursor square.
- ←** Moves the cursor square left one point.
- Moves the cursor square right one point.
- ↑** Enables text cursor editing.
- CTRL** **←** Moves the cursor square ten points to the left.

CTRL → Moves the cursor square ten points to the right.

SHIFT ← Moves the cursor square left to the first point plotted.

SHIFT → Moves the cursor square right to the last point plotted.

* Allows entry of a 'star' command.

= Allows entry of a 'colon' command.

4. Displaying graphs

The INTER-CHART display mode is used to construct a finished graph. The graph may be perfectly adequate as shown immediately upon entry to display mode, but it would be more usual to make small changes. During display mode, titles and explanatory headings can be added and edited, scaling can be changed, graphs can be overlaid, etc. The changes made in display mode are mainly cosmetic. Only by displaying the finished graph does the need for such changes become apparent.

So many functions can be performed in display mode that, following the convention of using practical headings, each operation is described under a bold heading. This should make it easier and quicker to find the information relevant to the desired operation.

Entering display mode

From the menu, pressing the **7** key will select display mode. This will immediately show the currently selected graph (the name of which is shown on the main menu) as a line graph. If no data has been entered for the current graph, or if no current graph exists, then axis will be displayed, but it follows that nothing will be displayed on the axis. To select another graph, simply return to the menu and use option-5.

On entry to display mode, the amount of memory free is shown on the screen. If there is insufficient memory left to achieve a graphics mode display, an error message "No room" will be issued upon trying to select display mode and the menu will remain. See "graphics mode selection" below for further details.

Pressing the **ESCAPE** key will leave display mode and return to the menu.

Graphics mode selection

All BBC Micro graphics modes, numbered 0, 1, 2, 4, and 5, are available for display mode. Each of these graphics modes 'steal' some of the available memory. On a standard BBC Micro

(model-B) only about 24K bytes of memory are available before any data is entered. Each of the graphics modes requires a large proportion of this to achieve their display. If there is not enough free memory for a mode, the mode just isn't available. As a generalised view, the 'better' graphics modes take most memory. Each mode offers different facilities in terms of resolution, number of colours available (including background), the number of text characters per line (all offer 32 lines), and the amount of memory used. These details are summarised in the table below:

MODE	RESOLUTION	COLOURS	TEXT	MEMORY
0	640×256	2	80×32	20K
1	320×256	4	40×32	20K
2	160×256	16	20×32	20K
4	320×256	2	40×32	10K
5	160×256	4	20×32	10K

On entry to edit mode and display mode, INTER-CHART selects the best mode it can, according to the amount of memory available. If 20K is available, it will select mode-0. If less is available, it will select mode-4. If less than 10K is available, then no graphics display is available! INTER-CHART issues a "No room" message in such circumstances. The only recourse when this happens is to delete something in order to free some memory. The simplest way to do this is to save individual graphs with menu option-3 and delete them with menu option-8.

Applying the information above, it is possible to select the graphics mode used for display. Pressing the function key **f1** will prompt for entry of a graphics mode number. Entering the desired mode number and pressing **RETURN** will select that mode – if it is possible.

The choice of graphics mode should be considered before anything else when displaying, since it affects the size of labels possible, choice of colours and shading, etc.

One final note about screen mode selection regards the use of 'shadow RAM'.

Shadow RAM. (Model B+, Watford 32K, Aries B20)

The term 'shadow RAM' describes a system which has become very popular for the BBC Micro. As described in the previous paragraphs, the availability of the various graphics modes depends upon the amount of free memory. Shadow RAM can be used instead to store the graphics screen, leaving ALL of the 24K or so of normal RAM for data. Shadow RAM is not *added* to the top of normal BBC memory, but instead overlaps just the screen memory area. It is visualised as sitting behind normal memory, as a 'shadow', hence the name.

Shadow memory is standard in a BBC model B+ and will probably also be available on any later versions. Several add-on boards are available for model-B micros and offer the same facility. At the time of writing, the two most popular boards, which are compatible with INTER-CHART, are the Watford 32K RAM board, and the Aries B20 RAM board.

With such a shadow RAM system in use, *all* of the graphics modes will be available, regardless of the amount of free memory. Shadow RAM is very useful when the amount of data being used with INTER-CHART is large.

Scaled graphs and labelled graphs

Scaled graph data can only be displayed as line graphs, not as bar or pie charts. Label type graphs (those produced with 'discrete' data) can be displayed in any of the three graph forms.

Selecting Line, Bar or Pie charts

On entry to display mode for the first time, the current graph data is displayed as a line graph by default. When using discrete data (i.e. the x-axis labelled rather than scaled) it is possible to select the type of graph used. Pressing the function key **f3** will prompt for the choice of graph type. The choice of Line, Bar or Pie is selected by pressing the **L**, **B** or **P** key. Upon selection, the display will be cleared and the new graph displayed. Any headings overlaid on the graph remain in the same positions and may need to be altered. Entering and editing headings is described later in this section.

The choice of graph type is stored with the data for the current graph so that, when re-entering display mode at a later date, the

previously chosen graph type will be used. As well as the graph type, the mode choice and shading selection are also saved with the current graph data both in memory and when saved with option-1 or option-3.

Often, when several related sets of data exist as separate graphs, they need to be combined into one graph for comparison. This is done by 'overlaying' graphs on top of each other.

Overlaying graphs

Combining several graphs into one is achieved by overlaying them. Pie charts cannot be overlaid under any circumstances. As many as sixteen graphs (the maximum which can be entered) can be overlaid onto one screen display.

The screen always contains the current selected graph. If this graph is not required as one of the overlay set, do not select it! Use menu option-5 to select a graph which is required.

It is advisable to consider each of the overlaid graphs in isolation before overlaying them. Display each one alone, before complicating the screen display with overlays.

Choose as current the graph onto which the others are to be overlaid. The graph choice (bar or line) selected for overlaid graphs will apply when they are overlaid. For instance, a bar chart could be overlaid onto a bar chart, though this facility is not often used. As many further graphs as desired can be overlaid by pressing function key **f0** to select each. Pressing **f0** will prompt for the name of a graph to overlay. Each graph overlaid will be drawn according to its own colour selection. It is possible in this way to show overlaid graphs in different colours.

If the graph being overlaid requires larger scales, the current display will be re-scaled to accommodate

Selecting a different graph, with menu option-5, will clear all of the overlays and display just the selected graph. Overlays can also be removed from the display by using a function key.

Clearing overlaid graphs

Function key **f2** can be used to clear all overlaid graphs from the display. The individual graphs are left intact, but not shown. The screen is cleared and the current graph alone is displayed.

Printing

Printing of the displayed graph, including any overlays, is achieved whilst still in display mode. Pressing function key **f4** will activate the built-in Epson printer screen dump. An external screen dump can be used by loading and executing it from disc (machine code dumps only), with a ***RUN** command. If an external screen dump is available in ROM, then it may be executed with its usual 'star' command. A graphics window is defined around the actual graph, but excluding the input lines. Screen dumps should therefore dump only the contents of the current graphics window, in order to avoid printing the execution command as well! The built-in dump does, of course, work this way.

Printing is discussed in detail in section-6.

Colours and shading

The colours used to fill bars, segments or draw the line in the various graphs can be selected and freely changed by using menu option-6. The options for colour are many and varied. Section-5 describes the use of colour in detail.

Adding headings to graphs

No headings are added automatically to graphs, because the choice of wording and position often depends upon personal choice. Whilst in display mode, the user may freely enter headings and position them anywhere on the graph. They can later be taken off the graph, edited and moved.

The term heading is used here in a very generalised manner, meaning any text the user wishes to place anywhere on the graph. This could be a multi-line title for the graph, explanatory wording, almost anything.

To enter a heading:

Pressing the **f5** function key initiates heading entry and

editing, causing a cursor, shaped like a left-hand square bracket, to appear on the graph at the bottom-left corner. The normal cursor keys can then be used to move it around the graph. Two speeds of movement are possible: pressing just the cursor keys will move the arrow slowly around the screen; holding down the **SHIFT** key at the same time as pressing a cursor key will move the arrow more quickly. This allows fast movement to the approximate area, then exact positioning to take place.

Once the heading cursor has been positioned, text may be typed at the keyboard, after which pressing **RETURN** will terminate input and display the heading on the graph at the cursor position. Note that text is typed in the entry line at the bottom of the screen, then transferred to the graph when complete. The heading cursor remains on the screen for repeated use until **ESCAPE** is pressed to terminate heading editing.

Headings are stored with the data for each named graph, so that when the graph is re-displayed, the headings are too.

To edit a heading:

Once heading words have been entered onto a graph, any of them may be changed, deleted, or moved to a new position. The **f5** key should be used to enable heading editing, unless still active from previous use. Position the cursor anywhere on the heading to be altered and press the **COPY** key. This will 'pull off' the heading, removing it from the graph and entering it into the text editing line at the bottom of the screen. Once the text is in the editing line it can be deleted altogether by using the **DELETE** key and pressing **RETURN**, which indicates that no label is to be put back. It can be changed or added to and replaced on the screen by pressing **RETURN**.

Editing headings on overlaid graphs

As previously stated, any headings entered are stored together with the current graph data. This is always true for the entry of completely new headings. When overlaid graphs are displayed, only one of these is the current graph, but being able to alter *only* headings for the current graph would be very awkward. Instead, when the cursor is positioned on a label and the **COPY** key pressed, the label will be 'pulled off' from the overlaid

graph to which it belongs. If the label is deleted and **RETURN** pressed, then the label has been removed from the display and from that graph. If however, the label is changed, moved, or both, and then re-entered, it is put back on the *same* graph from which it came – not necessarily the currently selected graph.

Often, when headed graphs are overlaid, the headings for different graphs will overlap on the screen. These can then be 'pulled off' and replaced at an adjusted position.

Summary of heading entry/editing controls

- f5** Initiates heading entry/editing.
- ←** Moves the heading cursor left (slowly)
- Moves the heading cursor right (slowly)
- ↑** Moves the heading cursor up (slowly)
- ↓** Moves the heading cursor down (slowly)
- SHIFT** **←** Moves the heading cursor left (quickly)
- SHIFT** **→** Moves the heading cursor right (quickly)
- SHIFT** **↑** Moves the heading cursor up (quickly)
- SHIFT** **↓** Moves the heading cursor down (quickly)
- COPY** 'Pulls off' the label beneath the heading cursor.
- RETURN** Enters or re-enters the text on the input line as a heading.
- ESCAPE** Terminates heading input/editing.

Other display mode commands

The remainder of the command keys operable in display mode perform relatively minor cosmetic operations. Most ask a "yes" or "no" question, and the rest ask for input of numbers. A reply of just the **RETURN** key to any of these questions will retain the current setting, not necessarily a default setting.

H show Highlight (Y/N)

By default, the entry on which the cursor was left is highlighted on bar and pie charts. A highlighted bar is shown as solid white, and a segment is cut out from the main body. This can be turned off or back on by pressing the **H** key and answering Y or N to the prompt.

J Join points (Y/N)

The points plotted on a line graph are always joined with a line by default. This line is optional and can be turned off or back on by answering Y or N to the prompt issued by pressing **J**.

L show Labels (Y/N)

Pressing the **L** key allows the labels shown around a pie chart or on the x-axis of a bar chart to be turned off or back on. If for instance the labels are too long to fit, it may be better to turn off display of the labels. It is of course possible to use headings as labels instead. This has the advantage that the user can position them exactly where they 'look best'.

M Mark points (Y/N)

By default, when a line graph is drawn, the line joining the points obscures the single dot marking each point. Optionally however, all points can be marked with a small cross. Exactly how small the cross is will depend upon the resolution of the graphics mode in use.

P show Percentages (Y/N)

When displaying a pie chart, it is sometimes preferable to label the segments with their relative percentage of the whole, rather than the actual values. This option allows a choice between the two. In either case, use of the **L** option will turn on or off display of these values.

N Number format

This allows the number format to be changed between Exponential, General or Fixed. Once the choice has been entered, the number of digits will be requested. This specifies the number of digits shown before the exponent, the number of significant figures shown in general form or the number of decimal places shown in fixed format.

V VDU command

Similar to the normal BBC BASIC VDU command, this will allow input of a series of codes, and send them to the VDU drivers. For example, VDU19 can be used to alter the colours displayed on-screen. See the BBC User Guide for further information.

X X-axis change

The axis can be changed in various ways. The range of values shown can be specified, the scale can be logarithmic or linear and graduation lines can be shown. This single command issues prompts for each of these options.

The first prompt asks if the scale should be Logarithmic or Linear. It is linear by default. It should only be defined as Log on scaled graphs.

The second prompt asks for the range of the x-axis to be defined by giving the start and end values. If one value is entered this will become the start of the range and the end will remain unchanged. A comma followed by a number specifies a new end value. To specify a new start and end for the range, they should be entered with a comma separator. Any data which lies outside the specified range will not be shown. Note that pressing the **TAB** key (not in response to an X or Y prompt) will reset the automatic x and y scaling.

When defining the x range on a bar chart, the numbers used should correspond to the bar positions relative to the y-axis. Therefore, to display only the second bar to the tenth bar (nine in all) the range should be specified as 2 to 10.

The final question prompt issued will ask if graduation lines should be shown. Answering **Y** will cause dotted lines to be drawn perpendicular to the axis at each graduation position marked. An answer of **N** will remove the lines. All of these settings can be duplicated or individually specified for the y-axis by using the following command.

Y Y-axis change

This allows all of the options described in the **X** command to be set for the y-axis.

***** 'star' command

Star commands may be output from the display mode. This allows all of the usual operations, but is particularly useful for accessing external screen dump routines. This is covered in the section on printing.

Summary of display mode commands

f0

Overlay graph

f1 Select mode

f2 Clear overlays

f3 Change graph type

f4 Print graph

f5 Enter/edit headings

H show Highlight

J Join points

L show Labels

M Mark points

- N** Number format
 - P** Show percentages
 - V** VDU command
 - X** X-axis change
 - Y** Y-axis change
 - *** 'star' command
- ESCAPE** Return to main menu

5. Using colour

The colours used on graphs drawn in display mode are defined in a colour list by using menu option-6. The colours are used for the segments of a pie chart, bars of a bar graph, or the line drawn on a line graph. In addition to the usual colours available in the selected graphics mode, the unusual GCOL combinations which produce 'striped' colours can be used, and various densities of cross-hatching are available for use on bar graphs.

Selecting menu option-6 will display three columns of numbers. There are sixteen entries in each column, the first column contains the entry number, the second and third columns can be changed by the user. These are similar to the two numbers specified for a BASIC GCOL command, the first is the plotting option and the second is the colour number. For instance, entry 1 could be defined as 0 1, meaning plotting option 0 and colour 1. The various plotting options are described in the User Guide, but there is one important difference here, that plotting option 1 refers to the special cross-hatching available for use on bar charts. The various plotting options are listed below:

- 0 Plot the colour specified
- 1 Special hatching (bar charts only)
- 2 AND the specified colour
- 3 XOR the specified colour
- 4 Invert the colour already there

Having listed the colours it may seem strange to now say that the various options are not very useful. However, there are several good reasons for including them. It is necessary to be able to select cross-hatching, and an option number of 1 will achieve this. Various combinations of 'out of range' plotting options and colours will display as striped patterns, which are useful as extra colours. A combination such as 77 77 will achieve a striped shading. The short BASIC program below can be used for experimentation to find other useful shades.

```
10 REM COLOUR DISPLAY
20 INPUT "WHICH MODE ?" M
```

```
30 MODE M
40 VDU 28,10,24,30,18
50 INPUT"Enter A,B" A,B
60 GCOL A,B
70 PLOT 4,300,500
80 PLOT 4,300,500
90 PLOT 85,300,1000
100 PLOT 85,1000,500
110 GOTO 50
```

These so-called 'extra colours' are due to a quirk in the operating system software. No list of useful numbers is given here because their use is non-standard and will vary on future versions of the BBC Micro. For instance the numbers used to achieve the effects are different on the model B+. Future versions of the BBC Micro may implement true colour shading and use the numbers for that or alternatively the numbers may not produce anything. In short, the plotting option is provided for flexibility.

Cross-hatching

When using bar charts, various cross-hatching patterns are available. Using menu option-6, the plot option should be set to 1 to specify cross-hatching and the number in the third column is then used to specify the hatching type.

The hatching number is determined by adding one value for each of: colour, hatch line angle and hatch line spacing. The numbers to be added for each of these is shown below:

COLOUR (MODES 0 and 4)

- 0 – black
- 1 – white

COLOUR (MODES 1 and 5)

- 0 – black
- 1 – red
- 2 – yellow
- 3 – white

COLOUR (MODE 2)

- 0 – black
- 1 – red
- 2 – green
- 3 – yellow
- 4 – blue
- 5 – magenta
- 6 – cyan
- 7 – white

HATCHING ANGLE

- 16 – up to the right
- 32 – down to the right
- 48 – horizontal

HATCHING SPACING

- 0 – narrow
- 64 – medium narrow
- 128 – medium wide
- 192 – wide

For example, while in mode-1, to produce hatching which is yellow, with lines angled upward to the right and narrow spacing between, the numbers 2+16+0 should be added together to produce a hatching number of 18. Using menu option-6 to define set the first entry to 1 and 18 in the second and third columns respectively would cause the first bar to be filled with the desired hatching in display mode.

Note that when the built-in screen printing is used, different shades of grey are printed to correspond to the different colours on screen.

6. Printing graphs

A great deal of thought has gone into methods of printing graphs produced by INTER-CHART. Every effort has been made to cater for the plethora of printers which can be, and frequently are, attached to the BBC Micro.

When a computer graphics screen is to be printed, a special routine is required. This is usually called a 'screen dump' and such a routine is almost exclusively intended for dot-matrix printers. (Daisywheel printers cannot usually print graphics at all.) It looks at the patterns of dots on the graphics screen and sends appropriate control codes to the printer in order to print the same pattern of dots. Printer manuals refer to this as 'Bit image printing', and give instructions for its use in less than easily comprehensible terms. In other words, unless you have a suitable screen dump routine, it is very difficult to use the facility. Home-brewed routines are well beyond the scope of the beginner.

The problem which faces software authors is that most of the different types of printers offering bit-image printing use *completely different* codes. The only way to support *all* printers, is to provide completely different screen dump routines for every different printer. Whereas this might be possible with an unlimited amount of program memory and time, this is not the case with the BBC Micro.

The most common make of printer used on the BBC Micro is the Epson printer, and several other manufacturers use the same codes, providing much-needed compatibility. For this reason, INTER-CHART includes a screen dump routine for Epson printers. In addition, instructions later in this section describe how users of other types of printer should be able to achieve a high level of compatibility with external screen dump routines. In this way INTER-CHART can be used with almost any printer.

Using the built-in screen dump

The simplest way to print the screen is by using the built-in screen dump, but this is, as previously described, only suitable

for Epson and compatible printers. To use the built-in screen dump, proceed as follows.

Enter the display mode and build the required display, including any headings or overlays. Ensure that the printer is switched on, connected and on-line. When ready, press the function key **f4**. After a slight pause while the first data is sent, the printer will burst into action, printing each line with a slight pause between. When printing has finished, the display screen remains for any further commands to be entered.

If printing is not successful, refer to the end of this section, headed 'fault finding', for assistance.

It is not advisable to press the **BREAK** key to abort printing before completion, which will at very least leave the printer in the middle of a printing sequence. Instead press the **ESCAPE** key which will stop as soon as possible (within a few seconds) and leave the printer ready to start again.

Any colours shown on-screen are printed as shades of grey. The screen is printed sideways, i.e. with the bottom of the screen at the left hand side of the sheet being printed. This helps to keep the proportions of the printed copy as near as possible to the original screen display.

Using a screen dump ROM

Several ROMs are available which contain various screen dumps for several types of printer. It is quite possible that the user might want to use even those for the Epson printers if they provide some additional features. For instance PRINTMASTER, available separately from Computer Concepts, will allow expanded screen dumps to be produced, useful on a wider printer such as an FX100.

Screen dump ROMs are used by issuing a 'star' command. Exactly what the command is will depend upon which particular ROM is used, since each has its own conventions. Refer to the relevant manual for details.

Whilst in the display mode, with the graph to be printed shown on the screen, the appropriate star command can be entered in the bottom lines without upsetting the graph displayed. As soon as the star command is issued, control is passed completely to the ROM called. Control should return to INTER-CHART when the printing is complete without memory being altered. If there is any doubt about the memory remaining intact when using a particular ROM, it is obviously advisable to save any current work before calling it.

Most screen dumps will dump only the area within the current graphics window. INTER-CHART defines a graphics window around the graph before star commands are called, enabling this facility to be used to the full if available. If the whole screen is dumped, then the star command itself will unfortunately be printed. Taking a pair of scissors to the output is the easiest way to solve this!

Using a machine code screen dump from disc

Many utility discs contain a machine code screen dump program. This is easily used from INTER-CHART, providing that it does not corrupt any of the vital areas of memory (zero page, and above the O.S. high water mark). Usually such dumps are short and run in an area such as **&C00 - &CFF**. If the dump used does corrupt memory, ensure that all work is saved beforehand.

Whilst the finished graph is displayed on the screen, a star command can be issued to load and run the program. For example, if the name of the dump is **DUMPER**, the command:

***RUN DUMPER~~RETURN~~**

would load and execute it. This assumes that the load and execution address are present and correct on the file. After use, the dump program should return to the INTER-CHART display mode.

Note that this method is *only* for programs saved as assembled code.

Using a BASIC screen dump

If neither a screen dump ROM, nor even a machine code screen

dump program is available, then the last resort is to use one written in BASIC. These are very slow and awkward to use, but sometimes they may be all that is available for uncommon printers. Because they need to run in BASIC, they cannot be executed directly from INTER-CHART. Instead, a screen image of the graph must be saved, then a BASIC program used to re-load the screen and dump it to the printer. The following description assumes that the user has a BASIC screen dump program suitable for the printer in use.

From the INTER-CHART display mode, the finished graph should be saved as a memory image using the ***SAVE** command. This command requires a name for the memory image, and the start and end addresses of the screen memory to be saved. The filename need not be in quote marks (""), but should conform to normal filename constraints. The name **SCREEN** is used in the example below. The start and end addresses of the memory to be saved depend upon the graphics display mode number in use at the time. These are expressed in Hexadecimal and a list of suitable commands is shown below:

Modes 0,1 and 2:

***SAVE SCREEN 3000 7FFF RETURN**

Modes 4 and 5:

***SAVE SCREEN 5800 7FFF RETURN**

After saving the screen, ensure that any work in INTER-CHART is saved, and enter BASIC with the command

***BASIC RETURN**

Load a BASIC screen dump program and add an extra line in the program at a position just before dumping starts, which selects the correct mode and reloads the screen, for example:

100 MODE 0: *LOAD SCREEN RETURN

Then execute the program.

These notes are provided more as 'hints' than as definitive instructions. As such, Computer Concepts can accept no responsibility for any additional work required to put the theory described into practice.

Fault finding

It is very difficult to solve hardware or software problems with any generalised methods. Some common problems are easily solved in this way, and these are described here.

The most frustrating problems often have the simplest causes. It is surprising how many hours can be wasted before noticing that the printer is not even switched on! Here is a simple check list:

- (1) Is the printer switched on at the mains?
- (2) Is there a mains switch on the printer itself? If so, is it switched on?
- (3) Is the printer connected to the computer?
- (4) Is there enough paper in the printer?
- (5) Is the printer ON-LINE?

Once the answer to all of these questions is "yes", there are several other possible causes which can often be traced from the effects observed:

(a) Nothing at all happens on the printer:

In this case, the CAPS LOCK and SHIFT LOCK lights will normally light on the computer. This means that the computer is trying to send data to the printer, but that the printer is not accepting it. Press **ESCAPE** to abort the dump. First ensure that the list of obvious faults (1)-(5) above is not the cause. There are only two further likely causes. The first is that the printer lead is faulty, or not quite fully plugged-in. The second is that the wrong printer interface is being used. A parallel interface is assumed, this connects underneath the computer with a wide flat lead. If a serial printer is in use, which connects by a thin lead to the socket on the back of the computer (marked "RS423"), then from the INTER-CHART display mode type the command:

***FX5,2RETURN**

and try printing again.

(b) Printer output is nonsense:

There are three usual causes for this problem. The first is that the screen dump being used is not compatible with the printer. If the built-in screen dump is being used, then the printer

should be an Epson, or compatible. The second likely cause is that garbled data has previously been sent to the printer, or that the **BREAK** key has been pressed in the middle of a previous print-out. In either case just switch the printer off and on again to reset it – but beware – save any current work first in case the power surge causes the memory to be corrupted, then try printing again. The final likely cause applies only to the use of a serial printer interface. The speed at which information is sent between the computer and the printer is pre-set at both ends. If the two do not match, the data will be garbled. Refer to the ***FX8** command in section-16, or in the BBC User Guide.

(c) Line spacing incorrect:

If there are very small gaps between each line (about 1mm or less), this is likely to be due to an inaccuracy of the printer's paper feeding mechanism. If there are complete line spaces, or there are no line spaces at all (the line being continuously over-printed), then the ***FX6** setting probably needs changing. If an extra line-space is being generated, issue the command:

***FX6,10** or failing that ***FX6,13**

If the line is over-printed, issue the command:

***FX6,0**

Any of these commands can be typed in menu mode or display mode.

(d) Some other fault ?

Seek the advice of an expert.

7. Using more than one graph

INTER-CHART allows as many as sixteen different sets of graph data to be manipulated, all in memory at the same time. Each set of data is given a name by the user when it is created and referred to by its name thereafter. Menu option-5 allows selection of another graph, re-naming of a graph and creation of a new graph.

When menu option-5 is selected, it displays a list of names of all graphs currently in memory, and positions a cursor on the bottom line below the last name. If however there are no graphs currently in memory, the user will be prompted to enter a name for the graph, then the type (Labelled or Scaled).

To select an existing graph: simply use the cursor keys **↑** and **↓** to move up or down the list of graph names, then press **RETURN** to select the one at the cursor.

To re-name a graph: move the cursor to the name to be changed and type the new name.

To create a completely new graph: move the cursor to the bottom line, which is blank, and type the name. Press **RETURN** to enter the name when complete. A prompt will then ask whether the new graph data will be for a labelled or scaled graph, to which the reply should be **L** or **S**.

Graph names: can only be a maximum of ten characters long, but may contain any printable character. The name of a graph is saved along with the corresponding data when menu options 1 or 3 are used. When additional graphs are loaded into memory, they may have the same names as some already there. This does not actually matter for selection purposes, but it is wise to change the names simply for clarity.

The difference between labelled and scaled graphs

Throughout this manual references are made to scaled graphs and labelled graphs. The first time that the user must know how

to distinguish between the two is when creating a new graph. To a statistician, the two basically different types of graph data are known as 'discrete' and 'continuous'. Continuous data has an infinite range of values between any two given values.

Distance for example, has no maximum, no minimum, and no set interval between two points. Other examples are time, temperature, speed, height and length, to name but a few.

Discrete data has a limited number of possible values. Months in a year for instance – there are only twelve possibilities.

Names of countries are another example, of which there are only a limited number, etc.

The two main types of graph are those which have a continuously varying quantity on *both* axis, which are referred to as scaled graphs in INTER-CHART, and those which have discrete data on the x-axis, referred to as labelled graphs in INTER-CHART.

Distinctions between the use of each type are explained in the relevant sections elsewhere.

The current graph

At any one time only one set of graph data is the currently selected one. The name of the current graph is always shown in brackets after option-5 of the menu. Edit mode and display mode will always work primarily upon the current graph. Therefore, in order to edit another graph, option-5 should be used to select it as the current graph. Similarly, to display a particular graph it should be selected as current.

At various points within this manual it is made clear that certain operations act upon only the current graph. If the current graph is not the correct one, then the correct one must be selected with option-5. There are several fundamental operations which work only upon the current graph.

Menu option-3 will prompt for a filename and save the current graph alone. Menu option-8 allows deletion of the current graph. Any importing from file or from an active ROM-LINK package will be added to the current graph. These are all examples of the necessity to select the correct graph as 'current'.

8. Saving graphs

Once graph data has been created, it can be stored for use at a later date by using either of two INTER-CHART menu options. The data is saved on the current filing system which can be cassette, disc (Acorn DNFS 1.00 or compatible), or Econet network. Detailed instructions of how to use each of these filing systems can be found in their respective manuals. Only details specifically about their use in connection with INTER-CHART will be covered in this manual. Special notes with regard to the use of various filing systems are given at the end of this section and the following section on loading.

Menu option-1 will save *all* sets of graph data currently in memory, in a single file, whereas menu option-3 will save *only* the current graph data. Both options will save not only the data itself, but also the graph names, any options set at the time of saving which control the screen mode for display, type of graph displayed (line, bar or pie), colour list, x and y range, etc. These are, of course, re-loaded along with the rest of the data with the load options, described in the next section.

Both options, upon selection, prompt for a filename. Once a filename has been input, INTER-CHART checks to see if a file of that name already exists and, if one does, the user will be asked whether the old file is to be overwritten. This avoids accidental loss of files through mistaken selection of a save option instead of a load option.

It is advisable to save all work regularly whilst being input or edited, as a safety measure. If the power supply to the computer fails at any time, any work in memory will be lost!

1) Save all graphs

This option will save all of the graphs, up to sixteen, in one file. This allows related sets of data to be stored together. Saving and loading individual files would be very time consuming and use many more filenames. The current option settings for each graph are saved along with the data.

Saving is very fast, taking only a few seconds at most on disc. After the file has been saved, the menu will be re-displayed ready for the next command. All data is left in memory after saving.

3) Save current graph

Sometimes, when a set of graphs is in memory, one particular graph needs to be saved alone. This option will save just the current graph data along with any display settings, in a file on its own. There are several occasions on which a single graph needs to be saved.

Memory too full

On occasions when memory becomes too full either to use a certain graphics mode or to enter further data, it is necessary to remove one or more graphs from memory. Choose one or two graphs which are least needed for the current task and save each with option-3, then delete them with option-8.

Transferring graphs from one set to another.

It will be found that, after using INTER-CHART for some time, different sets of graphs saved with option-1 are available for use. It is not possible to directly load just one graph from a file containing several in order to use it with other existing graphs. The answer instead is to load the whole set containing the graph and save it alone with option-3. A different set can then be loaded and the single graph added to those in memory by loading with option-4.

Tape filing system

Note that it is not possible for INTER-CHART to check for the existence of a particular filename entered when the tape filing system is in use.

Disc Filing system

Files are saved with the operating system's *SAVE command, so that saving is very fast. The filename specified may include the drive number and directory according to the usual guidelines. If insufficient room is left on the specified drive in order to save the file, a "Disc full" message will be issued by the filing system and the file will NOT be saved. If this

happens, ALL data in memory, including that in other ROM-LINK packages, should be saved on a different disc and then the orginal disc compacted. Note that the ***COMPACT** command destroys all memory, hence the need to save everything first. The catalogue on an Acorn DFS disc only allows 31 filenames per disc side and an error message "Cat full" will be issued if an attempt is made to create more.

Econet filing system

The operating system ***SAVE** command is used by INTER-CHART to save files, making it as fast as possible on Econet. Note however, that a check is made for the existence of a file of the same name before saving takes place. This is done by opening the file as a data file and closing it again. The now antiquated Econet level-1 software does not support data file handling and cannot therefore be used in its standard form.

9. Loading graphs

In order to re-load data with menu options 2 and 4, files must first have been saved with either option-1 or option-3, described in the previous section. Data saved from a word processor, exported to file from a ROM-LINK package, or generated by some other program can be loaded with option-9. This type of loading is referred to as importing from file, and is dealt with in isolation in section-11. This section deals with menu options 2 and 4 only.

The main difference between options 2 and 4 is that option-2 will remove any graphs already in memory before loading, whereas option-4 leaves existing graphs and loads one or more from file in addition.

2) Load new graphs

This option will clear any graphs already in memory and then load the graphs from the named file. A safety-net prompt asks the user to confirm the use of this option if any graphs are already in memory, in case of accidental selection. The file loaded can have been saved with either option-1 or option-3, as described in the previous section.

4) Load additional graphs

This option will allow one or more graphs to be loaded into memory in addition to any already there. It is usual to load additional graphs one at a time, as saved with option-3, but multiple graphs saved with option-1 can be loaded in this way also. If the file being loaded contains multiple graphs, it is possible that the number of graphs already in memory, together with the number being loaded, would exceed the maximum of sixteen. In this case the file will be loaded, but only the number of graphs to make a total of sixteen will be retained. If the file is too long to fit into the available memory, an error message "File too long" will be issued and the loading aborted.

Cassette filing system

INTER-CHART does not reset the default cassette options set initially by the operation system. This means that, by default,

no messages at all will be output when loading a file from cassette. This applies equally to option-9 for importing files. In order to make the CFS issue prompts and error messages, the following star commands should be entered at the menu stage before loading. These options will remain active until another filing system is selected or **BREAK** is pressed. The commands are:

*OPT 1,1 **RETURN**
*OPT 2,1 **RETUNN**

10. Deleting a graph

A single graph can be deleted from memory with menu option-8. Only the current graph, the name of which is shown in brackets on the menu, can be deleted in this way. Therefore, the graph to be deleted should be selected as current by using menu option-5.

Deleting a graph will leave more room in memory for other uses. For instance, when memory becomes too full to allow a graphics mode, one or more graphs can be deleted with option-8 in order to restore memory. Remember that a single graph can be saved with option-3 in case it is required for later use.

Because the action of deleting a graph is irreversible (unless the graph was saved), a safety-net prompt will ask the user to confirm the operation before it is performed.

11. Importing data from file

INTER-CHART allows graph data to be taken from any of three sources: keyboard, directly from a ROM-LINK package, or a file. This section deals with taking data from file, using menu option-9. This allows data to be created by say, a BASIC program or a word processor, and then read into INTER-CHART. Data exported to file from another ROM-LINK program, such as INTER-SHEET, can also be loaded in this way, since the file format has deliberately been kept the same.

The best way to envisage importing from file is to imagine that everything is read from file just as if it were being typed at the keyboard in edit mode. Entering data for a scaled graph for instance, consists of a pair of x and y values separated by a comma and followed by **RETURN**, all being repeated for any number of data pairs. The file format is exactly the same. In fact, to make the format compatible with files exported from ROM-LINK programs, a **TAB** character can be used in place of the comma.

Importing a file into a labelled graph is also the same as entering data from the keyboard, but with the additional complication of ensuring that the auto step-on is set to correspond to the data. This is because of the flexibility provided in importing, allowing just values, just labels, or both at once to be read. If auto step-on were turned off, every data value read would simply over write the previous data in the same position, because the entry cursor would not have been moved. Instead, Auto step-on should be set as follows:

Importing values only: *step on label, value (either)*

Importing labels only: *step on label, value (either)*

Importing label followed by value: *step on value*

Importing value followed by label: *step on label*

This may look complicated at first sight, but it is really quite obvious. It should be set to step-on when the next entry is about to start. Therefore if all the data is the same type – all labels or all values – it should step to the next entry position after every entry. If a label is followed by a value, which is at the

same entry position, then obviously it should only step on when the value is entered.

When data is imported, it is entered starting at the current cursor position, always in the currently selected graph. This means that data from file can be added to any existing data in the current graph, simply by setting the cursor to the next free entry position before importing. Note that on a labelled graph, imported data will overwrite any already there if the cursor is left on it. It is also possible to import one file after another into the same graph.

Importing from a ROM-LINK file

As mentioned, INTER-CHART can import a file which was exported by another ROM-LINK package. This is often useful if there is insufficient room in memory for the other package to allow direct transfer.

ROM-LINK files are all of the same basic format of rows and columns. Each entry in a row is separated by **TAB** characters, with a **RETURN** character at the end of each row. For instance, an area consisting of two short columns of number exported by INTER-SHEET would be as follows:

```
@A1
10 TAB 25 RETURN
9 TAB 35 RETURN
8 TAB 45 RETURN
7 TAB 55 RETURN
6 TAB 65 RETURN
5 TAB 75 RETURN
4 TAB 85 RETURN
```

The first line is issued on files exported by INTER-SHEET to show from which box the first data came. This can be ignored for use with INTER-CHART, and is ignored by the INTER-CHART import file.

A data file which is to be imported into a scaled graph should be in the format as above, with x values in the first column and y values in the second.

A data file which is to be imported into a labelled graph may be in any of the acceptable forms with one or two columns. The important point to remember is that the auto step-on should be correctly set, using **f6** from edit mode, before the file is imported. An example of a file exported by INTER-SHEET for import into INTER-CHART as a labelled graph is as follows:

```
0A1
"Jan TAB 100 RETURN
"Feb TAB 100 RETURN
"Mar TAB 200 RETURN
"Apr TAB 300 RETURN
"May TAB 400 RETURN
"Jun TAB 500 RETURN
```

Using the above data, the auto step-on would be set to *value* so that the entry cursor moved to the next entry position after each value was entered.

Using data from BASIC programs

Any programming language with data file handling can produce a data file for use with INTER-CHART. The descriptions here apply to BBC BASIC, but the underlying principles remain the same irrespective of the language used.

It is very unlikely that any BASIC programs already in existence will output data suitable for importing to INTER-CHART without modification, but it should be possible to take any file of a known format and write a conversion program. The data format for imported files has already been described above and is very simple.

One important point to remember is that the BASIC command **PRINT#** produces a specially coded internal format. This *cannot* be read by INTER-CHART, for which the data must be in a normal readable ASCII form, without unusual control codes.

Instead of using, for instance, the command:

PRINT#file, number

or

PRINT#file, name\$

a special procedure should be used to write the number or string to file in ASCII form. The following procedure writes any

number or string to file. The file channel is assumed to have already been opened.

```
200 DEFPROCwrite(file,string$)
210 LOCAL loop
220 FOR loop=1 TO LEN(string$)
230 BPUT#file,ASC(MID$(string$,loop,1))
240 NEXT loop
250 ENDPROC
```

This procedure expects always to be given a string, rather than a number. It should be used for both, but numbers should be passed as an ASCII string using the **STR\$()** command to convert, and strings should be preceded by a quote mark (""). For instance, assuming that the output file has been opened and the handle put into the variable **chan**, the following two lines could output A\$ and A, respectively, showing the general format for strings and numbers:

```
PROCwrite(chan,CHR$34+A$)
PROCwrite(chan,STR$(A))
```

Note that no separating characters have been output. A **TAB** character is output with the command:

BPUT#chan,9
and a **RETURN** character is output using the command:
BPUT#chan,13

In summary, the following program will prompt for input of ten label strings, and ten corresponding numbers (for use as labelled graph data), open a file named **export1** and write the data suitable for importing into INTER-CHART.

```
10 REM exporting a file from BASIC
20 DIM Label$(9), number(9)
30 CLOSE#0
40 FOR n=0 TO 9
50 INPUT "Enter label, number
"label$(n),number(n)
60 NEXT n
```

```
70 chan=OPENOUT "export1"
80 FOR n=0 TO 9
90 PROCwrite(chan,CHR$34+Label$(n))
100 BPUT#chan,9
110 PROCwrite(chan,STR$(number(n)))
120 BPUT#chan,13
130 NEXT n
140 CLOSE#chan
150 PRINT"Finished."
160 END
200 DEFPROCwrite(file,string$)
210 LOCAL loop
220 FOR loop=1 TO LEN(string$)
230 BPUT#file,ASC(MID$(string$,loop,1))
240 NEXT loop
250 ENDPROC
```

Once the above file has been produced, it can be imported into INTER-CHART using menu option-9. Ensure that the currently selected graph is a labelled graph and is ready to accept data. The auto step-on should be in its default setting to step on values.

Importing problems

If all of the data imported into a labelled graph overwrites each entry on top of the next, reset the auto step-on correctly.

If blank entries are left between imported entries on a labelled graph, or labels and values are made as separate entries, this implies that the auto step-on is incorrectly set.

If a syntax error occurs during importing, this means that there is a mistake in the data in the file. This is likely to be a missed quote mark which should precede all labels, or a spurious character in the middle of a number. This may also be caused by attempting to load label strings into a scaled graph. Yet another possible cause is attempting to import numbers from INTER-SHEET columns which are too narrow to display the number, in which case INTER-SHEET exports what would be seen on screen – a row of asterisks – which INTER-CHART cannot understand as a value.

12. Using ROM-LINK

In order to understand how to use ROM-LINK commands correctly, it is necessary to understand what the ROM-LINK system is. This section simply provides the user with background information on the ideas and operational techniques behind the ROM-LINK system. The next section describes how to actually transfer data to INTER-CHART using ROM-LINK.

Many so-called integrated programs allow transfer of data only by saving the data on disc and re-loading it from another program. On the whole, this is both slow and inconvenient. The ROM-LINK system is designed to provide true integration. Not only can data be passed by file in the usual manner but it can also be transferred IN-MEMORY.

With a set of data for one ROM-LINK program in memory, another ROM-LINK program can be used immediately without saving the data on disc. The second program can 'ask' the first for some or all of the data. It is then transferred in-memory for use by the second program. In fact, more than one set of data can be handled by the *same* ROM-LINK program, allowing as many as sixteen packages of data to be held in memory by one or more programs all at the same time.

Each set of data belonging to a program is referred to as a *package*. There could be, for instance, five separate spreadsheets in memory at the same time, but all used by the same ROM. Only one package is actually used at one time, but any other can be selected for use and data can be read from any other package in memory into the current one. The term package is used throughout the descriptions of ROM-LINK commands. It must be remembered that this refers not to a program, but to one set of data, of which there can be as few as one or as many as sixteen in memory at once.

Each program implements a common handling of ROM-LINK commands. All ROM-LINK commands are preceded by a colon character (:) to distinguish them from any other commands.

They are often therefore called 'colon commands'. Colon commands are provided for transfer of data and as simple utilities.

Importing and Exporting

Only one package of data is ever 'active' at any one time. Other packages lie dormant in memory waiting to pass their data to the active package, or to be themselves selected as the active package. Most of the ROM-LINK programs recognise commands which request some or all of their data to be exported. There will usually be a variety of commands for transferring different amounts or different types of data. For instance, the spreadsheet program INTER-SHEET offers commands such as GETBOX to return the result from a single spreadsheet box, and GETBOXES which allows an area of boxes within the spreadsheet to be transferred.

At any time the active package may ask any dormant package for any of its data by using the colon commands implemented in the ROM which owns the dormant package. For instance, with a dormant spreadsheet package and an active INTER-CHART package in memory, the active INTER-CHART package may request data from the dormant spreadsheet. The dormant spreadsheet package is temporarily 'woken' by the transfer request and processes the command. The data is passed back to the active package which remains in control. Only the active package can request data, the dormant package exports the requested data, and the active package imports it. It should be understood that dormant packages are only used when specifically requested to supply data.

Because there may be many packages in memory at the same time, it is necessary to distinguish between them. Otherwise a request for a spreadsheet box might get a result from *all* of the dormant spreadsheet packages! Each package is given a unique identity consisting of the name of the program to which it belongs and a package number between 0 and 15 inclusive. For instance, INTER-SHEET0, INTER-SHEET1 and INTER-CHART0 may all exist at the same time. Whenever a request for data is made, the name of the dormant package must be specified. Obviously these names are far too long to type easily, so they

can be abbreviated, usually to the first two letters of the name and a full-stop plus the package number. For instance **INTER-CHART1** could be referred to as **IC.1** and **INTER-SHEET11** as **IS.11**.

INTER-CHART is not seen as a tool for calculating results, more as an aid to graphically displaying the results produced by another package such as **INTER-SHEET**. **INTER-CHART** itself offers no colon commands for data transfer. This means that no active package can request data from a dormant **INTER-CHART** package. However, it is obviously possible to import data into an active **INTER-CHART** package, as is its true purpose.

Utility colon commands

INTER-CHART offers no utility commands itself but, as with importing, it can use any which are provided by other ROM-LINK programs. For instance, **INTER-SHEET** offers several useful colon utility commands, all of which can be used by **INTER-CHART**, just as if **INTER-CHART** itself contained them. Whenever a colon command is entered, the ROM-LINK program in use will execute the command if it can. If it fails to recognise a command, it will offer it to other ROM-LINK programs present in the machine (regardless of whether they have yet been used). If the command is recognised by another ROM-LINK ROM, it will execute the command and return control to the the ROM from which it was issued. If the command is not recognised, then a message "**Bad ROM-LINK command**" will be issued.

Further details of ROM-LINK colon commands can be found in section-17 later in this manual. Details of how to use ROM-LINK data transfer follows in the next section.

13. Importing from ROM-LINK packages

The previous section described the use of ROM-LINK in general terms for those who are not already familiar with it. This section describes the methods of importing data for scaled and for labelled graphs.

Data is always imported into the current graph in the active package and so ensures that the correct graph is selected before going any further. If no current graph is selected, e.g. on entry to the system, and an attempt is made to import, an error message will indicate the fact. In order to import data, a dormant package with export potential must exist. If INTER-CHART is the only type of ROM-LINK package present in memory, then data cannot be imported.

When data is imported it is, to all intents and purposes, treated just as if it had come from the keyboard. Therefore data for a scaled graph must be imported in x,y pairs and data for a labelled graph may be imported as label and value pairs or separately as labels and values.

Importing into a scaled graph

Only one arrangement of data is allowed for importing direct into a scaled graph. The values must be arranged in two columns, x followed by y, but there may be as many of these pairs as necessary – available memory being the only limit. As an example, if a package INTER-SHEET0 exists with a series of values in columns A and B, running from A1 to A30 and B1 to B30, these may be imported into INTER-CHART. Column A will be used as the x values and plotted against column B, the y values. The area to be imported is therefore described as A1:B30.

A colon command for importing data can be issued either from the menu mode or, perhaps more sensibly, from the edit mode. Since only results can be imported for use by INTER-CHART, the **GETBOXES** colon command should be used when importing from INTER-SHEET. The package name from which

data is to be imported is specified first, followed by the **GETBOXES** command which expects to find the required area specified immediately after. The command to import the area A1:B30 from INTER-SHEET0 would therefore be:

:IS.0:GETBOXES(A1:B30) RETURN

Importing even quite large areas is very rapid. The above would take less than a second to perform. If the command was issued from menu mode then the "Press any key" message would be displayed after transfer. If however the command was issued from edit mode, then the data would immediately be displayed.

If an attempt is made to import just one column, i.e. just the x values, then a "Bad data" message will be issued. This also happens if more than two columns are imported. If the data imported contains a label, which is not permitted, the transfer will abort with a "Syntax error" message at that point.

To clarify the command syntax, further examples of importing from INTER-SHEET packages follow:

- a) To transfer C5:D10, six pairs, from the package INTER-SHEET3, use the command:

:IS.3:GETBOXES(C5:D10) RETURN

- b) The specified area may be separated from the **GETBOXES** command by a space rather than parenthesis. To transfer A10:B19, ten pairs, from INTER-SHEET0, use the command:

:IS.0:GETBOXES A10:B19 RETURN

Importing into a labelled graph

Data is imported to the current cursor position in a labelled graph so it is important to position the cursor before issuing an import command. It is possible to import a set of values, a set of labels, or two columns containing one of each. Exactly which is imported will depend upon the circumstances, but whichever is used, the auto step-on must be set correctly on the same basis as when used for keyboard entry.

If just labels or just values are imported, the auto step-on may be set to step on **label**, **value** - i.e. either. Obviously a

graph containing just labels or just values is meaningless, so whichever is initially omitted can be imported with a second transfer command, which could even be from a different source (another package, a file, or entered at the keyboard), remembering to reset the cursor position before the second transfer.

If labels alone or values alone are being imported, they may be in the form of a row or column. However, if labels and values are imported together then they must exist as two consecutive columns. If a row of labels and a row of corresponding values are imported, they must be imported separately, not together. For example, data in the spreadsheet in the form:

A	B	C	D	E
1	2	3	4	5

must be imported one row at a time, a row of labels, and a row of values, remembering to manually reset the cursor position inbetween. But if the data is in the form:

A	1
B	2
C	3
D	4
E	5

then it may be transferred as an area. In this case the auto step-on should be set to step on **value**. Some examples follow.

- To import a series of labels in the row A1 to H1, in INTER-SHEET2, position the edit cursor at the first position and set the auto step-on to **label, value**. To import the data use the command:

:IS.2:GETBOXES A1:H1|RETURN

To read a corresponding set of values from the row beneath – A2:H2 – re-position the cursor as above and leave the auto step-on as above also, then use the command:

:IS.2:GETBOXES A2:H2|RETURN

- b) To import from INTER-SHEET15 two columns of data in which A1:A12 hold labels and B1:B12 hold corresponding values, set the auto step-on to **value** and move the edit cursor to the first entry position, then use the command:
:IS.15:GETBOXES A1:B12 RETURN

The IMP function

A data item entered in edit mode may be replaced by a special importing function, named **IMP**. This function takes an expression in the form used by colon commands, i.e. package identity followed by source position (e.g. box number). Instead of performing a once-off import, it will cause the required import to take place when it is entered and also when the **TAB** key is pressed during editing the graph which contains it. This allows a set of graph data to consist purely of a series of instructions to import values from other packages, but to update the imported values again whenever necessary.

REFERENCE SECTIONS

14. The Menu

When first entering INTER-CHART the main menu is displayed, as shown in Fig.10 below.

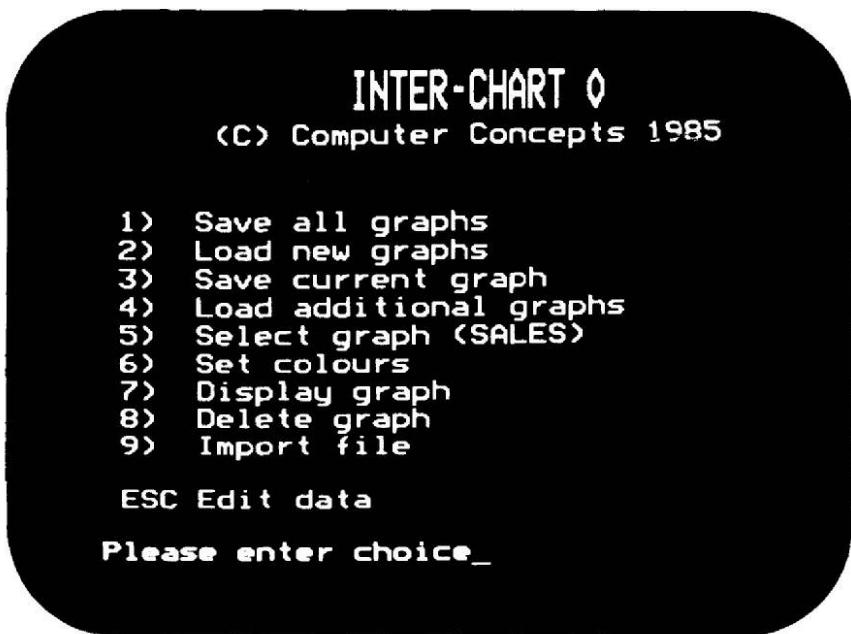


Fig.10 The main menu.

Pressing one of the option numbers shown above will select that option. Pressing the **ESCAPE** key will alternately select the edit mode and the menu, each time it is pressed. There are, however, other operations performed from the menu, even though they are not explicitly shown as options.

* Commands

Pressing the **↓** key whilst the menu is displayed on the screen will move the cursor down a few lines and prompt for a 'star' command. This allows operating system commands such as ***KEY** and ***FX** to be entered. Commands from other ROMs including the filing system can also be entered. Be careful not to use commands which corrupt memory, such as ***COMPACT** and ***COPY**, which would destroy any data in memory. For further details of useful ***** commands see section-16.

: Commands

Pressing the **:** key whilst the menu is prompting will allow a ROM-LINK 'colon' command to be entered. These perform operations concerned with ROM-LINK such as importing data from another package in memory. ROM-LINK commands from packages other than INTER-CHART are also available. Typing the command

:HELP [RETURN]

will list the colon commands available. If INTER-CHART is the only ROM-LINK program fitted, no commands will be listed.

Menu options

1) Save all graphs

All sets of data in the current INTER-CHART package will be saved in one operation. A prompt is issued for the filename to be used. If the filename specified has already been used, a further safety-net prompt asks:

Replace old file ? (Y/N)

Answering **Y** overwrites the existing file of the same name, answering **N** simply returns to the menu prompt with nothing saved. When using the cassette filing system, no prompts will be issued unless the O.S. cassette options are set.

2) Load new graphs

This option will load a group of graph data sets into memory. Any graph data already in memory will be lost when this option is completed. A safety-net prompt:

Are you sure ? (Y/N)

will be issued if any graph data is already in memory.

Answering **Y** will complete the operation loading new data and

overwriting the old. Answering **N** will abort the operation with nothing loaded and the old data intact. When using the cassette filing system no prompts will be issued and no re-tries will be allowed when a loading error occurs, unless the O.S. cassette options are set with the *OPT command (see section-9).

3) Save current graph

Whereas option-1 saves as many as sixteen sets of graph data, this option will save just the current graph data. As with option-1, a prompt is issued for the filename and a safety-net prompt will prevent accidental overwriting of an existing file of the same name.

4) Load additional graphs

Whereas option-2 will load one or more graphs, but delete any already present, this option will load one or more in addition to those already in memory. The file loaded may have been saved with option-1 or option-3. If an attempt is made to load more graphs than the limit of sixteen, the extra ones beyond the limit are ignored.

5) Select graph

At any time during the use of INTER-CHART, as many as sixteen sets of graph data may be present, but only one is the current graph. Referring back to fig.10, it can be seen that the name of the current graph is shown in brackets after menu option-5. If no data has been entered then the word "(none)" is displayed instead.

6) Set colours

This option allows selection of colours to be used for display of the graph. The user may define sixteen colours in a list, which are used in order for each bar or segment drawn.

7) Display Graph

This option will select the highest resolution mode possible within the current memory available, or the one selected for the current graph, if defined. If insufficient free memory is available, a "No room" message will be issued.

8) Delete graph

This option is used to delete the *current* set of graph data. Before actually deleting the data, a safety-net prompt:

Are you sure ? (Y/N)

will be issued, to protect against accidental choice of this option.

9) Import file

Data exported to file by another ROM-LINK package, or created by an external program or word processor, can be loaded with this option. The data must be in the correct format for the type of graph into which it is being loaded. For successful importing into a labelled graph, the auto step-on option may first have to be set. Data is loaded starting at the current cursor position in the current graph.

ESC Edit data

Pressing the **ESCAPE** key will select the edit mode, provided that sufficient memory is available. If a current graph exists, it will be displayed ready for editing, otherwise a prompt will ask for the name of a graph to create. Further presses of the **ESCAPE** key will alternately select the menu mode and edit mode. When used on a standard BBC model-B, 10K of memory must be available in order to select edit mode. If less than this exists, an error message "No room" will be issued. Note that the menu options for saving will still operate if this occurs. It is up to the user to decide what to remove from memory in order to continue.

15. Function Keys

The keys **f0** to **f9** are assigned functions as detailed below. Some of the keys, **f0** to **f5** inclusive, are used during display mode, and the remaining four, **f6** to **f9**, are used during editing. Function keys may also be assigned strings for use at any time – menu, edit and display. Programming function keys is described at the end of this section.

f0 OVERLAY GRAPH

In display mode, this function allows graphs to be overlaid on top of the current one. Only Line and Bar graphs can be overlaid. The user will be prompted to input the name of the graph to overlay.

f1 SELECT MODE

Provided sufficient memory exists, any of the graphics modes 0, 1, 2, 4 and 5 may be selected.

f2 CLEAR OVERLAYS

When further graphs have been overlaid on top of the current graph, pressing **f2** will remove them. The display is re-drawn to show just the current graph.

f3 CHANGE GRAPH TYPE

Discrete data can be displayed in the form of a line, bar or pie chart, as selected by this key.

f4 PRINT GRAPH

This starts the built-in screen dump to print the currently displayed graph, including any overlays shown. This is only suitable for Epson and compatible dot matrix printers. Note that this can also be used from edit mode, though this would only really be useful for diagnostic purposes.

f5 ENTER/EDIT HEADINGS

Pressing this key will activate the on-graph heading cursor. This allows new headings to be typed anywhere on the graph, and existing headings to be modified or moved. Pressing the **ESCAPE** key terminates heading input/editing.

The remaining four function keys are operative only during edit mode.

f6 AUTO STEP-ON

This key is used only during entry/editing of labelled graphs. Automatic step-on causes the cursor line to move on to the next position when data is entered. Four settings are possible: step-on when a label is entered, when a value is entered, when either is entered, or no step-on. The auto step-on setting is vital when importing labelled graph data from a ROM-LINK package or from file.

f7 DELETE ENTRY

This key will delete the data entry at the cursor. When used with a label type graph, the bar will be removed completely and the display re-scaled accordingly.

f8 INSERT ENTRY

This key is used only during editing of labelled graphs. When pressed, it causes the display to be re-scaled and opens a gap for one new data entry at the cursor position.

f9 DELETE TO END

This key has a rather drastic effect, deleting all data entries at and to the right of the cursor. A safety-net prompt is issued when the key is pressed to avoid accidental use.

User defined function keys

The ability to program strings into the function keys is available in INTER-CHART. The ***KEY** commands are used in the normal way. In menu mode, pressing a function key alone will generate the programmed string. In edit and display modes however, the strings are generated by pressing the function key whilst holding down **SHIFT** and **CTRL** together.

Function keys can be programmed from BASIC before entering INTER-CHART, they can be programmed from a !BOOT file, or from the keyboard whilst using INTER-CHART. A simple example of a !BOOT file would be:

```
*||boot file for INTER-CHART
*I CHART
*KEY 0 *IC.0||M
*KEY 1 *IS.0||M
```

The above should be saved on disc as "BOOT" and the disc option set to "EXEC" with the command ***OPT 4,3 RETURN**. Using the example above, pressing **SHIFT BREAK** to execute the **!BOOT** file would enter INTER-CHART and define **f0** and **f1** to swap between INTER-CHART and INTER-SHEET (assuming INTER-SHEET is present in the machine of course). Pressing **SHIFT CTRL** together with **f0** would issue a ***I CHART** command and pressed together with **f1** would issue a ***ISHEET** command.

16. 'star' commands

Star commands are those preceded with the asterisk character (*) and execute a command in the operating system or in another ROM. If the command is unknown, either because it doesn't exist or because it has been typed incorrectly, the error message "Bad command" will be issued.

The most common star commands which are useful whilst using INTER-CHART are those implemented by the DFS chip (assuming discs are in use), and the operating system itself. A list of useful commands follows, with examples using the Acorn DNFS 1.00 and operation system 1.2.

*** FX6** – This command controls the printer ignore character. If the printer is over-printing on the same line, issuing no line-feeds, use the command *** FX6, 0 RETURN**. Conversely, if too many line-feeds are being issued, causing alternate blank lines, issue the command *** FX6, 10 RETURN** and failing that try *** FX6, 13 RETURN**

*** FX8** This command is used for setting the computer's serial transmitting speed. When a serial printer is in use, it may be necessary to set the correct 'Baud rate' to prevent the data from becoming garbled. The *** FX8, n** command should be used, where 'n' defines the Baud rates as follows: 1=75, 2=150, 3=300, 4=1200, 5=2400, 6=4800, 7=9600 and 8=19200.

*** FX11** This sets the time delay after which a key held down will repeat. The command *** FX11** will turn off the auto-repeat, and *** FX11, 50** will set it approximately back to normal.

*** TV** Sometimes the display on a particular monitor will lose the top or bottom line of the display. This command can be used to move the displayed position up or down by a number of lines. Screen steadiness can also be a problem on some monitors and the *** TV** command can also be used to improve this. The command is followed by two numbers, the first number should be 0 to leave the height of the display as it is (when the second setting is of primary importance) 1, 2, 3, etc to move the display

up that many lines, and 255, 254, 253 would move the display down 1, 2, 3, lines, etc. The second number should be 0 or 1, which will affect the display steadiness. Either setting can be tried.

***HELP** In order to list the names of the ROMs in the machine, use the command ***HELP RETURN**. Following this with the name of a ROM will usually list more detailed information about that ROM, if it is available. For instance ***HELP DFS RETURN** will list the commands available in the DFS ROM.

***KEY** This command is used to program the function keys with strings. Any strings programmed will be issued when **SHIFT** and **CTRL** are held down at the same time as the function key. Just the function key alone need be pressed when working in the main menu.

***BASIC** This will exit INTER-CHART and enter the BASIC ROM.

***.** This is an abbreviation for the ***CAT** command.

***CAT** This will list all files on the current drive, or on any other drive if its number is specified, e.g. ***CAT 1 RETURN** will list all files on drive 1.

***SAVE** This command will save any area of memory within the machine. It is useful for saving screen memory when an external screen dump is to be used. It should be followed by the filename, the start address of memory to be saved and the end address of memory to be saved, both expressed in Hexadecimal.

***LOAD** This will load a file directly into memory, overwriting anything already in that area. It should be followed by the filename and the load address in Hexadecimal. It must NOT be used instead of the menu options for loading – the effect is quite different.

***RUN** A machine code program can be loaded and executed with this command. This is useful for executing a machine code

screen dump routine. The command is optionally followed by the load address and execution address, both in Hexadecimal. This command should be used with care to avoid memory corruption.

Note that many star commands will corrupt memory contents or may prevent INTER-CHART from functioning correctly. They should be used with care.

17. 'colon' commands

Colon commands are those implemented by the ROM-LINK integrated system. Any ROM-LINK compatible ROM may contain a number of commands which can be executed from that ROM, or in fact from any other ROM-LINK ROM. These are all preceded by a colon character (:) to distinguish them from other commands. Whenever a colon command is typed, the ROM being used will check to see it contains that command itself. If it does not recognise the command, it will offer it to all other ROM-LINK compatible ROMs in the machine. If they recognise the command, they will accept and execute it. If the command is not recognised by any ROM, an error message will be issued. This system is very similar to that used by the operating system for passing star commands around the ROMs.

Colon commands are used primarily for transfer of data between different packages. For instance INTER-SHEET provides colon commands for transferring box contents to another package. No package can 'force' information on another, but any package may request information from any other.

INTER-CHART itself provides no colon commands at all, it has no information to offer other packages. However, INTER-CHART can accept data from another packages, such as INTER-SHEET. This is called 'importing'.

As well as colon commands for data transfer, some general utility commands are provided by some ROMs. INTER-SHEET is the primary ROM-LINK package offering all of the major facilities such as saving or loading all packages at once, cancelling a package, etc.

Exactly which colon commands are available for use will depend upon which ROM-LINK ROMs are present in the machine.

Typing:

: HELP RETURN

will list all the colon commands available in the system. If only INTER-CHART is present, no commands will be listed.

The ROM most commonly paired with INTER-CHART is INTER-SHEET. The colon commands offered by INTER-SHEET which are useful in INTER-CHART are listed below. These are divided into two groups, data transfer commands and general utilities.

INTER-SHEET data transfer commands:

These must be preceded by :IS.n where n is the INTER-SHEET number from which data is to be exported.

- :GETBOX (box)** – transfers a single box result.
- :GETBOXES (area)** – transfers the results from an area.
- :TYPE (expr)** – transfers the single result of the expression specified in the command.

General utility commands

- :CANCEL** – Removes the current package from memory.
- :INFO** – Lists all current ROM-LINK packages and their memory usage.
- :PRINT (expr)** – Displays the result of the expression specified.
- :SAVEALL (fsp)** – Saves all current ROM-LINK packages in one file.
- :LOADALL (fsp)** – Loads all packages, as saved with the above command.

Further details of these and any other colon commands can be found in their respective manuals.

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INTER- CHART

Computer Concepts

D I S P L A Y M O D E

E D I T M O D E

OVERLAY GRAPH	SELECT MODE	CLEAR OVERLAYS	CHANGE GRAPH TYPE	PRINT GRAPH	ENTER EDIT HEADINGS	DELETE ENTRY	INSERT ENTRY	DELETE TO END